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COMPUTER PROGRAMS FOR DISPLAY

FINAL REPORT

CONTRACT NUMBER NAS8-31331

IBM No. 75W-00157

July 25, 1975

(NASA-CR-143998) COMPUTER PROGRAMS FOR
DISPLAY Final Report (International
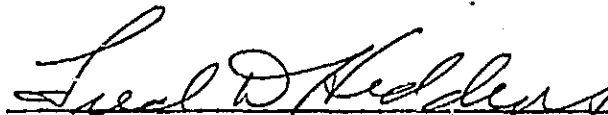Business Machines Corp.) 5 p HC $3.25
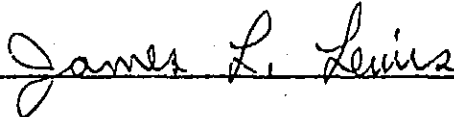CSCL 09B

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PREPARED FOR:

GEORGE C. MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
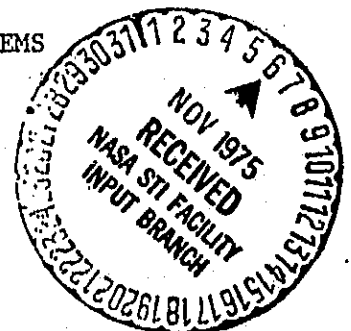MARSHALL SPACE FLIGHT CENTER, ALABAMA 35813

PROGRAM OFFICE APPROVAL _____

CONTRACTING OFFICER
REPRESENTATIVE CONCURRENCE _____

INTERNATIONAL BUSINESS MACHINES CORPORATION
FEDERAL SYSTEMS DIVISION – CIVIL AND SPACE SYSTEMS
HUNTSVILLE, ALABAMA 35805

IBM

AUG 6 1975

COMPUTER PROGRAMS FOR DISPLAYS

FINAL REPORT

The IBM Corporation, Federal Systems Division, in Huntsville, Alabama, has completed the requirements for the Computer Programs for Displays, Contract NAS8-31331. All scheduled milestones for software and documentation development were met or exceeded and the performance of the contract was completed at projected cost. All reviews were held with Mr. J. L. Lewis, COR, at the Marshall Space Flight Center. The Preliminary Requirements Review (PRR) and Preliminary Design Review (PDR) were combined (with permission from Mr. Lewis) and conducted on March 20, 1975. The Critical Design Review was conducted on April 24, 1975.

The objectives of this contract have been fulfilled in that Computer Programs for Display enable Assembly Language, Ground Operations Aerospace Language (GOAL), and the High Order Language (HOL) Preprocessor users to place display messages on disk in an off-line environment. This permits more efficient use of memory and a reduction in real-time processing requirements by the Space Ultrareliable Modular Computer (SUMC) Operating System when displaying messages to the Multifunctional Display System (MFDS) in the Concept Verification Test (CVT) Data Management System Simulator (DMSS). To accomplish this, an Assembly Language Preprocessor and a Disk Data Interface Utility has been developed for a host S/360/370 computer using OS/360. These programs retrieve, format, and build message data sets to be subsequently placed on the SUMC disk. Secondly, four macros were developed for the SOS Assembly Language user to define disk messages for the assembly language preprocessor and to define control and display interfaces. Finally, a set of utilities was developed to service and maintain the message data sets for the SUMC Operating System in the CVT Data Management System Simulator (DMSS).

The Assembly Language Preprocessor searches S/360 assembly language source statements and retrieves the required items to generate the disk message data set. This reduces user burden in placing message data on disk. The user codes the messages via the DISPLAY macro and the Assembly Language Preprocessor retrieves the messages and constructs a message data set. Upon completion of the preprocess step the source code is passed to the Assembler.

The Disk Data Interface Utility (DDIU) works in conjunction with the Assembly Language Preprocessor, GOAL compiler and the HOL Preprocessor and is used by each to generate a message intermediate data set that will be read later by the Display Generator Utility and placed on an operational disk for use by the SUMC. The DDIU formats the display data to a form required by the Multifunctional Display System (MFDS). The DDIU also accommodates TYPE1 programs. TYPE1 programs are BDX 910 (MFDS) programs that are sent to the MFDS from the SUMC to perform unusual display functions such as axis rotation, drawing circles, etc.

A composite set of macros has been developed to support the Assembly Language user. These macros include the DISPLAY, UPDATE, VCW, and CNTWD macros.

o DISPLAY macro - This macro is used to define background and add-on messages along with their variable data width, control word addresses, and variable data locations. The Assembly Language Preprocessor retrieves the message data to be placed on disk. Secondly, the macro expands, at assembly time, to the calling sequence to the SUMC Control and Display Executive.

o UPDATE macro - The UPDATE macro is used in conjunction with the Background display message to display variable data.

o Variable Control Word (VCW) macro - defines a variable data control word which includes: Size, Color, Intensity, Blink, Input Format and Output Format.

o Variable Control Word Update macro (CNTWD) - is used to modify the VCW during program execution.

The SUMC Disk Display Generator Utilities perform service and maintenance functions of the Display Messages Library. They receive the disk message data sets created by the DDIU as inputs and add or replace them in the SUMC Disk Message Library. Other functions performed by these utilities include generation of the library, deleting members, and condensing the library.

A Disk Display Users Manual was generated which describes how to use each of the above mentioned programs.

The SUMC Application Programmer's Instruction Manual was developed which describes the functions and use of the SUMC Operating System (SOS) capabilities.

Delivery of the contract end items was made to Mr. Lewis on Thursday, July 24, 1975. The delivery package consisted of four magnetic tapes containing two copies of program source and object modules for:

Assembly Language Preprocessor
SUMC Disk Display Generator Utility
Disk Data Interface Utility
Assembly Language Macros.

Attachment I contains a description of the file organization of the magnetic tapes. Also included in the delivery package were 10 copies of the User's Guide for these programs and 20 copies of the Application Programmers Instruction Manual.

COMPUTER PROGRAMS FOR DISPLAY DELIVERY TAPE DESCRIPTION

A. Source Tape (Tape Identification = SORC01 and SORC02)

File 1: Assembly Language Preprocessor

File 2: Control and Display-Display Data Interface Utility
DMSS-Disk Messages Generator Utilities

File 3: Catalog Option

File 4: Delete Option

File 5: Condense Option

File 6: Control and Display Macros

File 7: TYPE1 Program-Display Data Interface Utility

B. Object Tape (Tape Identification = OBJC01 and OBJC02)

File 1: Assembly Language Preprocessor

File 2: Control and Display-Display Data Interface Utility
DMSS-Disk Messages Generator Utilities

File 3: Catalog Option

File 4: Delete Option
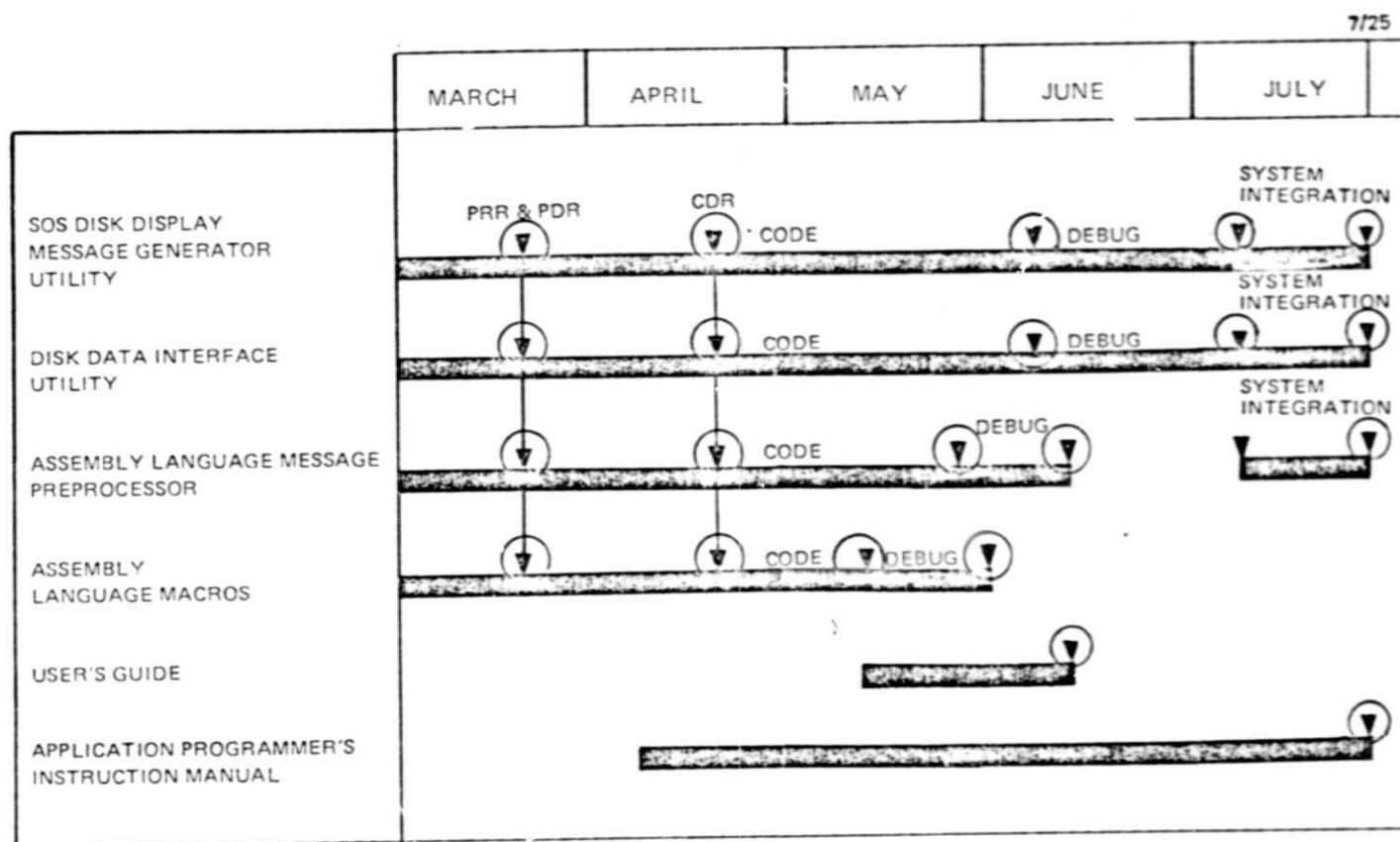
File 5: Condense Option

File 6: Miscellaneous Subroutines

File 7: TYPE1 Program-Display DAta Interface Utility

COMPUTER PROGRAM FOR DISPLAYS

DEVELOPMENT SCHEDULE

7/25

	MARCH	APRIL	MAY	JUNE	JULY	

SOS DISK DISPLAY MESSAGE GENERATOR UTILITY — PRR & PDR, CDR, CODE, DEBUG, SYSTEM INTEGRATION

DISK DATA INTERFACE UTILITY — CODE, DEBUG, SYSTEM INTEGRATION

ASSEMBLY LANGUAGE MESSAGE PREPROCESSOR — CODE, DEBUG, SYSTEM INTEGRATION

ASSEMBLY LANGUAGE MACROS — CODE, DEBUG

USER'S GUIDE

APPLICATION PROGRAMMER'S INSTRUCTION MANUAL

▼ (circled) COMPLETED

▼ SCHEDULED